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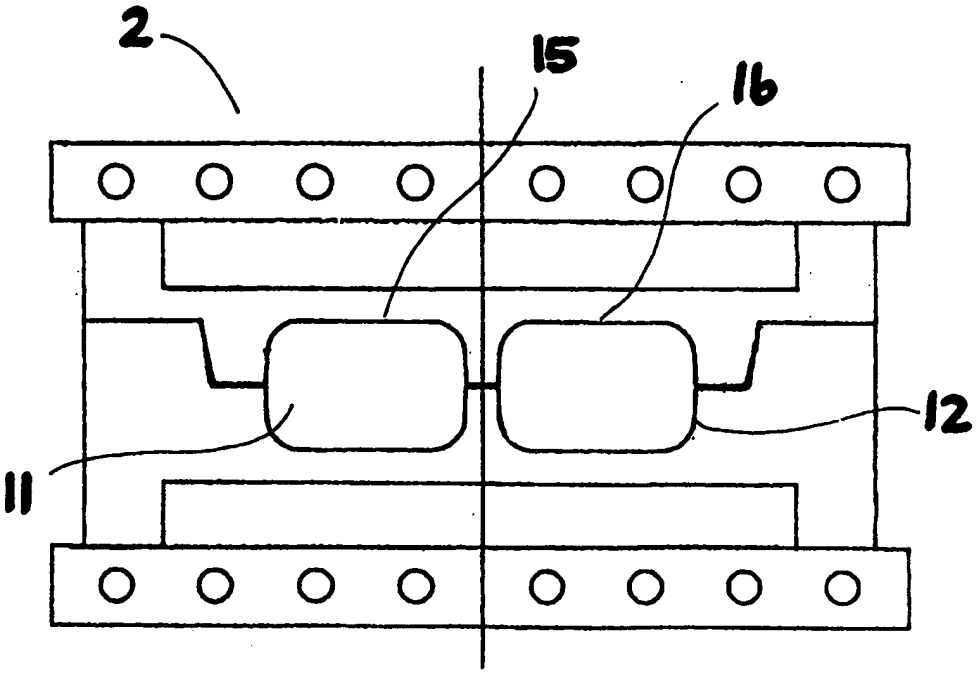
(54) Title: METHOD OF MANUFACTURING A STICK SHAFT



(57) **Abstract**

A method of manufacturing a player's stick for use, e.g., in ice hockey, bandy, field hockey or rollerblade hockey, wherein a core material consisting of wood or foam is enveloped by a shell of plastic, characterised in that the shell consisting of parts has colour and/or design patterns applied thereto whilst the parts are flat and before they envelop the core and are joined together.

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METHOD OF MANUFACTURING A STICK SHAFT

The invention relates to a method of manufacturing a player's stick. The stick can be used in various activities and sports such as field hockey, street hockey (rollerblade hockey), ice hockey or bandy.

To be more specific, the invention relates to a stick having a shaft consisting of a core which, e.g., may be made of wood or a polyurethane material. The core of thermoset plastic and optional fibres is enveloped by a sheath of a plastic material on which a pattern or decoration has been printed beforehand. The printing is carried out in the form of reversed or mirror printing on the reverse side by means of, e.g., silk-screen printing or sublimation printing (transfer printing). The sheath of plastic material is printed with colour, text or patterns on the reverse side whilst it is still flat. This means that the printed pattern will be extremely well protected by the actual plastic material.

Traditionally, sticks made of wood and possibly reinforced portions of glass fibre are used in the aforementioned sports. These wooden sticks are often made as laminates in time-consuming and complex processes. This means that the sticks are costly. A second factor is that the wooden sticks are liable to break and splinter, and a broken stick represents a danger to the safety of the players. Nor do the traditional sticks allow such extensive possibilities for design, print, patterns and colours as in the present invention.

A number of methods for manufacturing sticks of synthetic materials are also known, but none of the sticks have become widespread or accepted in the market. There are several reasons for this lack of acceptance, including price, quality and appearance, as well as properties such as cushioning, shaft smoothness and resilience, which are very different from the characteristics of the traditional wooden sticks with surface properties such as splintering and chipping. The new invention enhances safety among the players, gives the sticks better useful qualities and a longer active life. Above all, the invention provides the possibility of furnishing the sticks with special colours and designs.

As examples of known methods of manufacturing synthetic sticks, reference may be made to the following:

WO 82/03789 describes a method of making an ice hockey stick, wherein:

1) a core of polyurethane foam is formed and cured;
2) the blade portion of the core is perforated and several holes are drilled in the handle portion of the core;
3) each groove is filled with a strip of glass fibre-reinforced polyester;
4) glass fibre is applied to the reinforced core;
5) an outer layer of polyester-woven injection moulding is formed.

US 5217221 teaches an ice hockey stick consisting of a core of foamed plastic (24) covered with a glass fibre layer (20) and an outer layer of preformed wood veneer (16) impregnated with resin.

EP 172564 relates to a bat or an ice hockey stick which is made by covering a core of wood or synthetic fibres with a plastic shell. Parts of the stick are enveloped by glass fibre tapes to improve/increase its mechanical strength. The stick can be painted or stained, if so desired.

US 4013288 teaches a hockey stick which consists of a core of foamed nylon mixed with glass fibre. The stick is made by injection moulding and subsequent surface treatment.

These methods show different ways of manufacturing sticks, but none disclose sticks to which colours, designs or decorations can be applied with the aid of reverse printing technique. By using a technique of this kind, it will be possible to make sticks where the pattern or design is protected by an enveloping material.

The actual printing technique can be carried out efficiently in more controlled forms. This increases the possibility of using, e.g., four-colour printing technique and ornamentation of the whole stick shaft. This permits great flexibility so that, e.g., advertising can be introduced into the product. Similarly, the sticks can be decorated with club logos and the colours of a particular team. Thus, the product will have a distinctive appearance compared with today's sticks, inasmuch as the whole shaft can be decorated, whilst market flexibility and production management will be easier. (Product variants do not need to be stored temporarily prior to decoration, as the film is printed independently.) The shaft surface will be hard-wearing. Applied text will not be worn away. The shaft will be more impact-resistant, thereby reducing the problems caused by cracks, chipping and splintering. This enhances the players' safety as fibres and chips

do not become detached and lie on the ice. Nor will the product become sharp or splintered, which may be dangerous when player meets player in a match or training situation. The useful life of the product will be prolonged. The product will be better in that shaft friction can be adjusted and the shaft can be cushioned.

The invention will now be explained in more detail, with the aid of drawings, wherein:

Figure 1 is a cross-sectional view of a stick shaft;
Figure 2 shows a tool for enveloping the shaft around the core material;
Figure 3 shows an embodiment which discloses the varying sectional profile of the shaft.

In the present method for, e.g., making an ice hockey stick 1 a core material 11 is enveloped by a film material. The core 11 may, e.g., be made of polyurethane foam or wood. A plastic material is used as shell 12. The shell consists of several parts which together are complementary to the core. The thickness of the shell may be from 0.1 to 1 mm, preferably 0.2 to 0.35 mm. A thermoset plastic 13, e.g., epoxy, and optional fibres may be applied around the core to reinforce the shaft. Figure 2 shows a tool 2 for placement of plastic shells/film/plastic films, preferably two, each in its own mould cavity 15, 16, which are to envelop the shaft. These plastic shells/films consist of thermoplastic which is thermoformable and transparent. Here, the material may, for example, be a blend of TPU and ABS. The surface should have the correct friction, be impact-resistant and be prevented from cracking and becoming splintered or having sharp edges. TPU has elastifying and friction-modifying properties. Adjustments can be made for smoothness of the shaft. Before the material is moulded into a shell, print is applied to the material (the film) whilst it is still flat. This permits the application of print onto the product using known methods ("flat print methods"), which gives rise to great flexibility and accurate printing, independent of the finished product's appearance. The printing may be automated and followed by a rapid drying process. The shell parts are pressed together, each in its respective half of the mould. Cores of thermoset plastic and optional reinforcing fibres are placed between the shells, and the whole unit remains under pressure and heat in closed state until fully hardened (20 minutes). The final shape of the product is made in the tool, and all the components are bonded together with the aid of the thermoset plastic. The finished shaft is taken out of the mould and then all bits projecting from the sides of the shaft are trimmed away.

Before the shell parts are joined together with the core so that together they become a robust unit, colour or a design is applied to the shell parts. This application takes place with the aid of reverse side printing or sublimation printing. In this method, as the name suggests, the colour is applied on the reverse side. This means that designs and colours are extremely well protected by the surrounding shell layer. From a printing-technical point of view, the method also gives advantages over traditional printing, where the colours are applied on the outside and are thus more susceptible to damage and wear.

The core can be endowed with particular properties through the choice of material in the actual core, and it can be reinforced with, e.g., glass fibre yarn or the like.

Patent claims

1.

A method of manufacturing a player's stick for use, e.g., in ice hockey, bandy, field hockey or rollerblade hockey, wherein a core material consisting of wood or foam is enveloped by a shell of plastic, characterised in that the shell consisting of parts has colour and/or design patterns applied thereto whilst the parts are flat and before they envelop the core and are joined together.

2.

A method according to claim 1, characterised in that the colour application takes place by means of reversed or mirror printing on the reverse side by means of sublimation printing or silk screen printing.

3.

A method according to claims 1-2, characterised in that joining the core material and the shell parts takes place in a temperature range of from +10°C to 20°C, preferably from 20°C to 100°C.

4.

A method according to claims 1-3, characterised in that the shell consists of at least two parts prior to being joined together.

5.

A method according to claim 4, characterised in that the shell has a thickness of from 0.1 to 1 mm, preferably 0.35 mm.

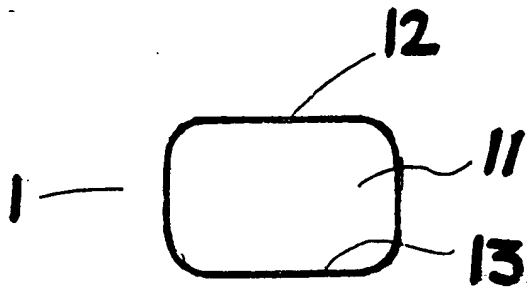

Fig.1

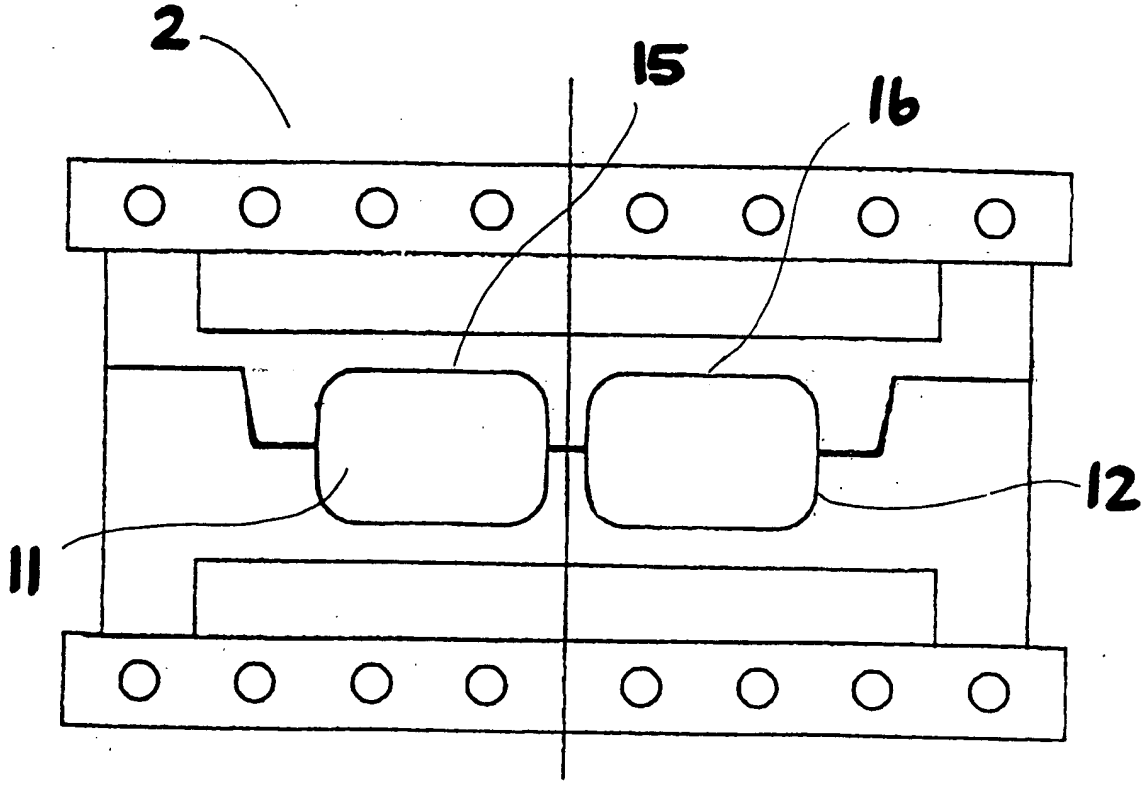

Fig.2

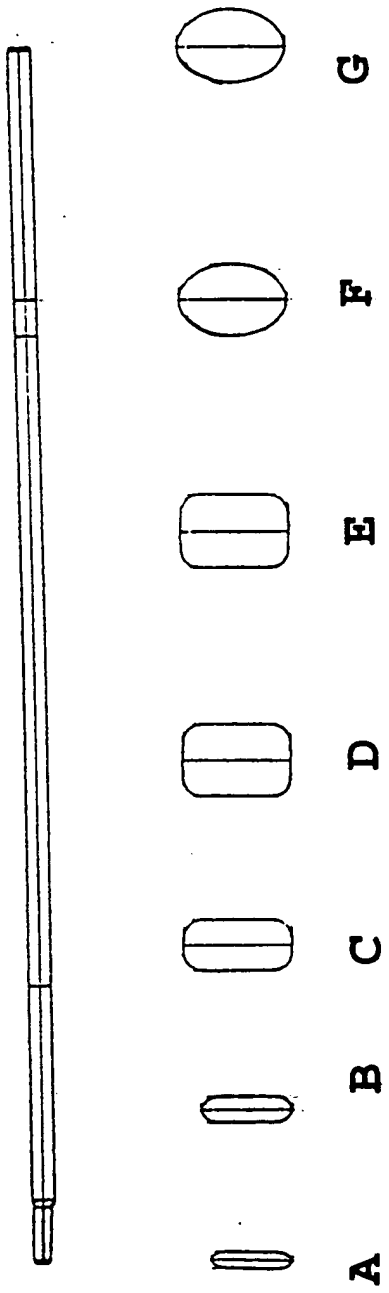

Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 98/00283

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A63B 59/12
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B. FIELDS SEARCHED

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4644630 A (S. BLUM), 24 February 1987 (24.02.87) --	1-5
P,A	WO 9840132 A1 (FORD, B.D.), 17 Sept 1998 (17.09.98) --	1-5
A	US 5525290 A (W.J. CARPENTER), 11 June 1996 (11.06.96) -- --------	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4644630 A	24/02/87	GB 2166361 A	08/05/86
WO 9840132 A1	17/09/98	CA 2199750 A	11/09/98
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